IMPLICATURE AND DEFINITE REFERENCE

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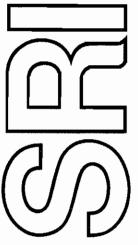
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ABSTRACT

An account is given of the appropriateness conditions for definite reference, in terms of the operations of inference and implicature. It is shown how a number of problematic cases noticed by Hawkins can be explained in this framework. In addition, the use of unresolvable definite noun phrases as a literary device and definite noun phrases with nonrestrictive material can be explained within the same framework.

Implicature and Definite Reference

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When someone is faced with a linguistic example, or any other text, his problem is to make sense of it. The question for those of us interested in the processes that underlie language use is, what must one do to make sense out of the example? More generally, what ways do people have of making sense out of texts?

There are two ways that I will focus on in these remarks: "inference" and "implicature". I use these terms in a rather special sense. Let us assume the hearer of a text has a knowledge base, represented as expressions in some formal logic, some of which is mutual knowledge between the speaker and hearer. "Inference" is the following process:

> If P is mutually known,
> $\quad P \supset Q$ is mutually known, and
> $\quad$ the discourse requires Q,
> then conclude Q.

One can view much work in natural language processing as an effort to specify what is meant by "the discourse requires Q". An elaboration of my own ideas about this can be found in Hobbs (1980, 1985). These remarks will present one aspect of that.

By "implicature" I mean the following process:

> If P is mutually known,
> $\quad P \wedge R \supset Q$ is mutually known, and
> $\quad$ the discourse requires Q,
> then assume R as mutually known and
> $\quad\quad$ conclude Q.

I will refer to R as an "implicature" and to the process as "drawing R as an implicature". This terminology is not inconsistent with Grice's notion of

conversational implicature—those things we assume to be true, or mutually known, in order to see the conversation as coherent. "Implicature" is a procedural characterization of something that, at the functional or intentional level, Lewis (1979) has called "accommodation".

The definite noun phrase resolution problem provides an excellent example of the discourse's requiring a conclusion Q. In the standard account of the resolution process (e.g., Grosz, 1975, 1978; Hobbs, 1975) the hearer must infer from the context and mutual knowledge the existence of an entity having the properties specified in the definite description. For example, in

> I bought a car last week.
> (1) The engine is already giving me trouble.

we use a rule in mutual knowledge like

(2) $(\forall x)car(x) \supset (\exists y)engine(y,x)$

to determine the referent of "the engine". Here the expression $car(C)$ in the logical form of the first sentence would play the role of P in the definition of "inference", and $P \supset Q$ is expression (2). The Q required by the discourse is $(\exists y)engine(y)$, since to resolve the reference of a definite noun phrase is to prove constructively the (unique) existence of an entity of that description.

P may be found in the same noun phrase as the definite entity, as in determinative definite noun phrases:

> the engine of my car.

It may be in previous discourse, as in (1). It may be in the situational context, as when, standing in a driveway, the speaker says,

> The car is already giving me trouble.

Or it may be in the mutual knowledge base—"the sun", "the President".

$P \supset Q$ is usually either trivial, as in

> I bought a car and a lawn mower last week.
> The car is already giving me trouble.

or in the mutual knowledge base, as (2) would be. In the latter case, $P \supset Q$ may introduce a new entity, as in (2); or it may not, as in

> I bought a Ford last week.
> The car is already giving me trouble.
>
> $(\forall x)Ford(x) \supset car(x)$

2

Having presented my vocabulary, I would like now to dispute an account of definite reference proposed by Hawkins (1982).[1] What I have been referring to as P, he refers to as an "appropriate uniqueness set" or a "frame". What I have spoken of as $P \supset Q$ being mutual knowledge he calls the "identifiability of the referent". To make the remainder of my critique as convincing as possible, I will use my terminology rather than his.

Under this substitution, Hawkins argues that P is necessary and sufficient for the definite article to be appropriate, whereas $P \supset Q$ is neither necessary nor sufficient. In contrast, I contend that both are required in the resolution process; thus, presumably, both are required for appropriateness. His data is convincing, so I am confronted with the problem of either explaining it or explaining it away. It is here that the process of implicature goes to work for me.

First let us consider the argument *against* the necessity of $P \supset Q$, or, equivalently, *for* the sufficiency of P. A key example comes from a doctor who says about an injured right arm,

(3)   You've severed the ulnar nerve.

P is the proposition $arm(A)$, provided by context. If in mutual knowledge there is a rule something like

(4) $(\forall x)(\exists y)arm(x) \supset ulnar\text{-}nerve(y) \wedge in(y,x)$

i.e., an arm has an ulnar nerve in it, then this is the required $P \supset Q$, and resolution is straightfoward. Hawkins points out that even if we do not know fact (4), example (3) is still felicitous. Therefore, $P \supset Q$ is not required for a definite reference to be felicitous.

I would argue to the contrary that fact (4) *is* required, but that we draw it as an implicature. For

$$P \wedge (P \supset Q) \supset Q$$

is an instance of $P \wedge R \supset Q$ in the definition of "implicature" given above, and (4) is an instance of $P \supset Q$. We can thus assume (4) to be mutual knowledge, and we will have satisfied the two requirements for definite noun phrase resolution (and, incidentally, we will have learned (4) as well).

The appropriate implicatures do not necessarily present themselves, of course. We need a means of arriving at the right things to draw as implicatures. The most important factor is that they are the missing pieces in

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[1] For a more extensive and more widely available treatment of definite reference, see Hawkins (1978).

a proof that would lead to a good interpretation. But that is not enough. We might expect analogy and specialization to be relevant here as well. In (3), we know that body parts, including arms, contain nerves, so the ulnar nerve is probably a nerve that the arm contains.

Where we cannot find the appropriate implicature $P \supset Q$, we cannot make sense out of the definite reference. To see this, consider another of Hawkins's examples. On a rocket ship we can be felicitously told

> This is the goosh-injecting tyroid.

even though we don't know that rockets have goosh-injecting tyroids, because we can recognize the "rocket" frame. Again we know P but not $P \supset Q$. But for all the complexity of rockets, our "rocket" frame is not all that complex: rockets have a particular shape and move in a particular way; they have fuel, and they have lots of parts whose names are likely to be unfamiliar. The word "injecting", the onomatopoeia of "goosh", and the scientific ring to the "-oid" ending all suggest that the reference is to one of those parts.

But suppose one were to show me a block of code in a computer program and say,

(5)   This is the goosh-injecting tyroid.

The definite reference would not be felicitous, even though I would recognize the "computer program" frame. I know too much about computer programs; the required implicature—that computer programs have goosh-injecting tyroids—would not be available.

Consider another example:

(6)   In Bulgaria, the travelers encountered the hayduk.

Most readers won't know whether the hayduk is a climatic condition, a ruler, a kind of bandit, a food, a kind of hotel, or what. Even though we can recognize the "Bulgaria" frame, the definite reference doesn't work. The context of occurrence gives us too little and what we know about countries gives us too much for us to be able to arrive at the right implicature.

We can summarize the examples in the following chart:

4

1. *P*:   arm

    $P \supset Q$:   arm has ulnar nerve (available implicature)

    Definite reference felicitous.

2. *P*:   rocket

    $P \supset Q$:   rocket has goosh-injecting tyroid (available implicature)

    Definite reference felicitous.

3. *P*:   computer program

    *$P \supset Q$:   computer program has goosh-injecting tyroid (not an available implicature)

    Definite reference not felicitous.

4. *P*:   Bulgaria

    *$P \supset Q$:   Bulgaria has hayduk (not an available implicature)

    Definite reference not felicitous.

These examples show that P is sufficient for felicitous definite reference if and only if $P \supset Q$ is mutually known or can be drawn as an implicature. When it cannot be, as in (5) and (6), the definite reference fails, even though P is known.

If this account is correct, then we ought also to be able to find cases in which P is drawn as an implicature when $P \supset Q$ is mutually known. This would constitute an argument against Hawkins's claim that P is necessary, or alternatively, that $P \supset Q$ is not sufficient.

But Hawkins himself provides just such a case. He claims that although we can point to a clutch on a car and say

(7) That's the clutch,

we cannot pick up the same object and say (7) after the car has been broken down for scrap and its pieces are lying in a heap. But in fact this is possible. Suppose A has broken down the car and B arrives, seeing only a pile of scrap metal. B picks up the object and asks what it is, and A replies with (7). To make sense out of the definite reference, B draws as an implicature the existence of the dismembered car. He may even reply

Oh, did all this used to be a car?

Here we have

Hawkins's case:

*P: car (implicature not drawn)

P ⊃ Q: car has clutch
           Definite reference not felicitous.

My case:

P: car (implicature drawn)

P ⊃ Q: car has clutch
           Definite reference felicitous.

Another example: Suppose I start telling you a story about the terrible hotel I am staying in, strictly as a funny story, and you respond by saying "The solution is to come and stay with us." To make sense out of your definite reference, I have to draw as an implicature that it is mutual knowledge that my situation is describable as a "problem", something which, seasoned traveller that I am, had not occurred to me before. Schematically,

P: problem (implicature drawn)

P ⊃ Q: problem has solution
           Definite reference felicitous.

A related example was suggested by Herb Clark (personal communication). A student enters his professor's office late and says

I'm sorry I'm late.
I was coming over here as fast as I could, but then the chain
    broke.

The professor is likely to draw the implicature that the student had been riding a bicycle. Schematically,

P: bike (implicature drawn)

P ⊃ Q: bike has chain
           Definite reference felicitous.

One day I wandered into a colleague's office where several people were standing around inspecting a computer terminal, a Heath-19, whose cover was removed and which my colleague had just modified. I listened to the conversation quite a while, not really understanding what was going on, until someone asked,

Where's the circuitry for the edit key?

Then I knew the terminal had been modified to make it easier to use the EMACS editor. I knew that EMACS required an edit key and that the Heath-19 lacked one, but prior to resolving "the edit key" by implicature, I didn't know that EMACS was central to the conversation. Schematically,

P: EMACS (implicature drawn)

$P \supset Q$:   EMACS requires edit key

             Definite reference felicitous.

Finally, we can in this fashion account for a common literary device employed in the opening sentences of novels—the use of an unresolvable definite noun phrase:

Strether's first question, when he reached the hotel, was about his friend.

In order to understand the reference to "the hotel", we have to draw the implicature that Strether is traveling, and we probably also assume he is in a city. This example is particularly nice since it shows that my account covers a case that has heretofore been dismissed simply as a literary device. Schematically,

P: traveling (implicature drawn)

$P \supset Q$:   when traveling, one stays in a hotel

             Definite reference felicitous.

We thus see that both P and $P \supset Q$ are required to be mutually known, but that either can be drawn as an implicature if the implicature is sufficiently accessible.

Implicature is not just a resource the hearer can use to make sense out of a text. It is also the source of a rhetorical device available to a speaker for conveying that P or $P \supset Q$ *should be* mutual knowledge, even though

it might not be. One example is the driving instructor who says "This is the clutch." The novelist's opening sentence is another. Less pleasant uses of implicature are also possible. For instance,

I saw my brother-in-law yesterday.
The bastard still owes me money.

To resolve the definite reference "the bastard", we must draw the implicature that the brother-in-law is a bastard.

If the implicature account of definite noun phrase resolution is to be compelling, we should be able to find other problematic cases that it solves. Of course text comprehension is rife with examples of implicature. But here is one case that is close to the examples we have just considered and that used to be a bit of a puzzle to me. It is the problem of what might be called the "non-restrictive" definite description. We all agree about what nonrestrictive relative clauses are: they provide new information instead of identifying information.

Yesterday I saw my father, who is 70 years old.

The nonrestrictive material can be in the adjectival position as well:

Yesterday I saw my 70-year-old father.

It can even be in the head noun:

Nixon has appointed Henry Kissenger National Security Advisor.
(8)   The Harvard professor has been in and out of government for much of his career.

We even find nonrestrictive material in pronouns. We see this in the text

I saw my dentist yesterday.
She told me...

"She" decomposes into "human" and "female". "Human" is used for identification and "female" is new information. This example shows that for the nonsexists among us, "he" contains nonrestrictive material in the text

I saw my dentist yesterday.
He told me....

I once thought (Hobbs, 1976) that definite noun phrase resolution for the nonrestrictive case involved somehow splitting the definite description into the identifying material Q and the nonrestrictive material R, and using Q for resolution. Thus, in (8) "professor" decomposes into "person", which is used for identification (Q), and "who teaches in a university", which adds new information (R). A similar example is from Clark (1975).

I walked into the room.
The chandelier shone brightly.

"Chandelier" decomposes into the restrictive "light" (Q), which normal rooms may be assumed to have, and the nonrestrictive "in the form of a branching fixture holding a number of light bulbs." A rule like the following would then be used for the resolution:

$$(\forall x)(\exists y) room(x) \supset light(y) \wedge in(y,x)$$

But the process of implicature provides a more elegant solution. Rather than split the definite description initially into Q and R, we attempt to do the resolution on $Q \wedge R$, the undecomposed definite description. If $P \supset Q$ is mutually known, then so is

$$P \wedge R \supset Q \wedge R$$

Then if P is known, we can draw R as an implicature and conclude $Q \wedge R$, as required. Thus the nonrestrictive case requires no special treatment at all. It is handled by the mechanisms already proposed.

More needs to be said about the process of implicature than I am prepared to say. As it is defined, it is a very powerful operation. We must discover constraints on its application, for otherwise any definite reference would be felicitous. Unfortunately, the only sensible suggestion I can offer is that the implicature must be plausible for independent reasons. I gave such plausibility arguments for the "ulnar nerve" and "tyroid" examples. A bicycle is not an unusual means to use to travel to a professor's office. It is not unreasonable to want to use the EMACS editor on a Heath-19 terminal. And so on. But working out in detail what "plausible for independent reasons" means will require a much larger framework than the one I have constructed here.

Acknowledgments

9

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